



Office of the Attorney General
State of Texas

DOCKET FILE COPY ORIGINAL

DAN MORALES
ATTORNEY GENERAL

June 16, 1994

BY OVERNIGHT MAIL

RECEIVED

JUN 17 1994

FCC MAIL ROOM

Office of the Secretary
Federal Communications Commission
1919 M Street, Room 222
Washington, D.C. 20544

Re: In the Matter of Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHZ Frequency Bands; CC Docket No. 92-166

Dear Commission Secretary,

Enclosed are an original and ten (10) copies of the Texas Advisory Commission on State Emergency Communications' ("TX-ACSEC") Reply Comments in CC Docket No. 92-166. Please distribute the filing as appropriate, and file mark the extra copy and return it in the enclosed self-addressed, stamped envelope.

Thank you for your attention to this matter.

Sincerely,

Scott A. Sawyer (by RAM)

Scott A. Sawyer
Assistant Attorney General
Counsel for TX-ACSEC

No. of Copies rec'd
List ABCDE

089

Before the
FEDERAL COMMUNICATIONS COMMISSION
 Washington, D.C. 20554

In the Matter of

Amendment of the Commission's Rules §
 Establishing Rules and Policies Pertaining §
 to a Mobile Satellite Service in the §
 1610-1626.5/2483.5-2500 MHz §
 Frequency Bands §

CC Docket No. 92-166

RECEIVED
JUN 17 1994
FCC MAIL ROOM

REPLY COMMENTS

**NOW COMES THE TEXAS ADVISORY COMMISSION ON STATE
 EMERGENCY COMMUNICATIONS (TX-ACSEC), by and through DAN MORALES,**
 the Attorney General of Texas, and submits these **REPLY COMMENTS** to the
 Commission's First Notice of Proposed Rulemaking in CC Docket No. 92-166, Released
 February, 18, 1994.

TX-ACSEC's initial comments filed in this proceeding referred the Commission to concerns TX-ACSEC had previously expressed in its Petition for Reconsideration and Reply to Opposition to Petitions for Reconsideration in GEN Docket No. 90-314. In that proceeding, TX-ACSEC requested that the Commission require providers of wireless-based communications services, such as Personal Communications Services (PCS), to provide E-9-1-1 systems with a single, uniform standard for delivery of the calling party's location. In the alternative, TX-ACSEC requested the Commission to initiate a proceeding to address E-9-1-1 and related issues with regard to PCS, cellular, and other relevant mobile services. The Mobile Satellite Services (MSS) proposed in this Notice of Inquiry are the type of "relevant mobile services" referred to in GEN Docket No. 90-314 and thus, any adoption of

rules and/or requirements that pertain to PCS, cellular or other relevant mobile services should also be applied to MSS.

The comments filed by the National Communications System (NCS)¹, Bernard J. Trudell², U.S. Coast Guard³, and the National Association of EMS Physicians⁴ follow the same general concerns expressed by TX-ACSEC in this proceeding and in GEN Docket No. 90-314. Citizens must be able to obtain emergency assistance regardless of the communications technology used to originate the emergency call. The comments of Mr. Trudell outline a number of specific details that must be considered and implemented by any mobile voice service provider in order to provide a complete service. For example, Mr. Trudell states:

To provide this increased benefit to search and rescue and 911 emergency response the following is needed by the responding organization:

- * Identification of the calling party
- * Location of the calling party
- * Routing of the distress message to the appropriate responder
- * Standard format for SAR⁵ distress and E-911 (ANI & ALI⁶) messages
- * Ability to return calls to the distressed party⁷

¹ See comments of the Secretary of Defense, Executive Agent of the National Communications System, received May 5, 1994.

² See comments of Bernard J. Trudell, dated May 4, 1994.

³ See comments of the U.S. Department of Transportation, United States Coast Guard, dated May 4, 1994.

⁴ See comments of the National Association of EMS Physicians, dated May 3, 1994.

⁵ SAR - Search and Rescue.

⁶ ANI - Automatic Number Identification; ALI - Automatic Location Identification.

⁷ See comments of Bernard J. Trudell, dated May 4, 1994, page 2.

This list of technical requirements for sending calls requesting emergency assistance is the minimum information needed by emergency service providers in order to respond to distress calls, regardless of the communications technology used to place the call.

If experience in the growth of cellular service is any indication of things to come⁸, it is imperative that the providers of MSS understand the systems and processes used to provide emergency response service and pro-actively prepare their networks to handle calls from their subscribers in the event they need emergency assistance.⁹ In addition, MSS providers must be aware that their subscribers expect they will be connected to a respondent that will actively respond to a call for emergency assistance and with such an expectation by subscribers, access to emergency services becomes an important, necessary, and integral part of those communications services.

Finally, on June 13, 1994, the Commission released its Memorandum Opinion and Order in response to petitions for reconsideration in GEN Docket No. 90-314. In that Order, the Commission stated that it would be initiating a proceeding in response to TX-ACSEC's petition in that proceeding in the near future.¹⁰ TX-ACSEC reiterates that the issues relating to the provision of MSS and all other wireless related services should be required to provide information to E-9-1-1 systems that are needed in order to respond to

⁸ See Attachment, Future Vision II: The 9-1-1 Imperative, W. Clay, Paxton, NENANEWS, May 1994.

⁹ Emergency response systems vary state by state and in some cases by local districts, MSS providers should make no assumptions about how state and local emergency response systems are designed or how emergency calls should be routed to them.

¹⁰ See GEN Docket No. 90-314, Memorandum Opinion and Order, Released June 13, 1994, page 78, paragraph 202.

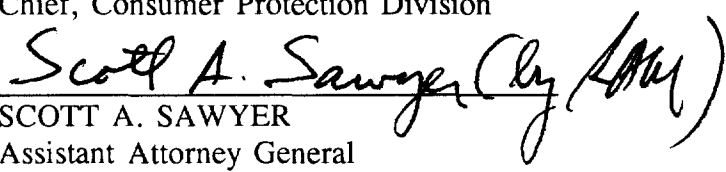
distress calls and that all requirements and/or recommendations adopted in the forthcoming proceeding be applied to all wireless services, including MSS.

Respectfully submitted,

DAN MORALES
Attorney General of Texas

JORGE VEGA
First Assistant Attorney General

THOMAS P. PERKINS, JR.
Assistant Attorney General
Chief, Consumer Protection Division


SCOTT A. SAWYER
Assistant Attorney General
State Bar No. 00785354

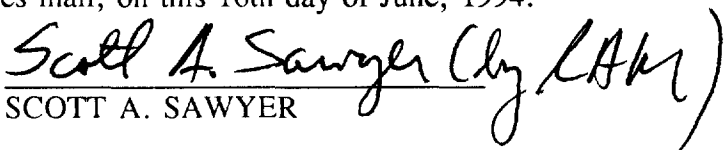
RUPACO T. GONZÁLEZ
Assistant Attorney General
State Bar No. 08131690

RICHARD A. MUSCAT
Assistant Attorney General
State Bar No. 14741550

Consumer Protection Division
Public Agency Representation Section
P.O. Box 12548, Capitol Station
Austin, Texas 78711-2548
Voice: (512) 475-4169
Fax: (512) 322-9114

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been served upon all parties of record, prepaid United States mail, on this 16th day of June, 1994.


SCOTT A. SAWYER

g:\par\data\ram2\fcc166.rep

Future Vision II: The 9-1-1 Imperative

by W. Clay Paxton

When last we visited our crystal ball and gazed into the future of 9-1-1, we saw a developing scenario of grave concern: a loose national network of emergency telecommunications systems that are rapidly deteriorating into a state of obsolescence. The principle cause is that while technology continues to evolve, stakeholders have failed to consider the processes, systems, and requirements of the embedded 9-1-1 infrastructure. Even now, as we are coming to realize the consequences and impact to our public safety responsibilities, technology continues to march forward with scarcely more than a glance back over the shoulder of "progress."

The Saga Continues

The lessons of history reveal much of the future. For example, the lessons learned from cellular technology should cause us serious concern as we look to the numerous other wireless technologies taking shape on the near horizon. The explosion of the cellular telecommunication market has far exceeded any forecaster's dream. So, too, the impact it has had on our Enhanced (E9-1-1) 9-1-1 systems and the processes used to provide emergency response services. For example, in 1982, the market forecast for cellular telephones projected one million units in service by 2002. In 1992, just half way into the forecast period,

the ten millionth unit was placed into service. Today, more than 7,000 new cellular telephones are installed daily in the U.S.¹, about 20% of those in California alone ... none of which are capable of E9-1-1 service.

What had been thought to be a minor technological aberration, easily accommodated using a default logic, is now poised to bring many 9-1-1 telecommunications systems to their knees. Witness January 1993. In that single month, one CHP (California Highway Patrol) communication facility (Golden Gate Communications Center) fielded 80,000 calls for emergency assistance; 25,076 (31.3%) of those were from

NETWORK DESIGN ENGINEERING, INC.

An Engineering Firm Committed to World-Wide Communications Excellence

We offer complete services for every stage of 9-1-1 and E9-1-1 planning, development, implementation, and maintenance.

MSAG CAPABILITIES

Master Street Address Guide

- Complete review of road and house names and numbers to develop an addressing system.

DMS CAPABILITIES

Database Management System

- Complete coordination with all agencies to create the E9-1-1 database.

CONSULTATION SERVICES

- Assistance to system administrators and operators in the planning, design, and installation of equipment and facilities.
- Feasibility reviews and recommendations about equipment capacity, capabilities, and costs with respect to system needs.
- Assistance in obtaining and administering federal grants.
- Comprehensive training for application hardware and software.

MAPPING

- Digital Mapping
- AM/FM/GIS Mapping
- Custom Software
- Spatial Data
- Tax Parcel Mapping
- Cadastral Mapping

OTHER SERVICES

- Communication Engineering
- Field Surveying
- E9-1-1 Conversion

Be Sure to Stop by Our Booth at the Las Vegas Convention

NDE

1200 Westpark II • Little Rock, Arkansas 72204
Phone (501) 666-4994 • Fax (501) 666-4538



BOOTH
329

EmergiTech, Inc.

6434 E. Main St.
Reynoldsburg, OH 43068

(800) 772-6125
(614) 866-6712

Public Safety Turnkey Systems

- Community Mapping & Addressing
- Enhanced 9-1-1 Customer Premise Equipment
- Map Display Systems
- Law Enforcement Records Management
- Fire Records Management
- Database Development
- TDD Call Handling
- Computer Aided Dispatch
- Jail Records Management
- EMS Billing

The PowerPhone Dispatch System

DISPATCHER TRAINING

- Specialized Two-Day Courses for Police, Fire or EMS
 - Quick-Tab Incident Reference Guides
- Single Service or Consolidated Dispatch

INTEGRATED . . . FLEXIBLE

Only from PowerPhone



Seminars &
Reference
Manuals
Now Available
In Spanish!

Only PowerPhone Trains All Three!

Seminars in Over 100 Cities



POWERPHONE

The Nation's Leading Dispatcher Training Company

1-800-53-POWER

cellular phones.² In 1987, the Massachusetts state police fielded about 300 cellular calls a month. By December, 1992, that number had grown to more than 15,700³, a growth of more than 1,000% per year!

Compounding this phenomenon, cellular telephones are no longer totally within the province of motor vehicle use. We now find them in pockets, purses and briefcases. Calls to 9-1-1 are regularly reported from malls, golf courses, pleasure boats, airplanes, offices, convention centers. (Did you see all the cellular phones being used at APCO in New Orleans?) and schools. The Cellular explosion has fundamentally transformed the very nature of telephonic communications; rather than being directed from place to place, we are coming to expect direct, dynamic *person-to-person* connectivity.

The cellular experience has also shown that people will adopt and use technology that improves their quality of life. The new emerging technologies of today will soon become the commonly used tools and appliances of tomorrow. Our bubble gum and bailing wire approach to accommodating emerging technologies within our 9-1-1 systems and emergency telecommunications is thus pure folly. Whether it's a plan to default-route cellular to a single emergency service provider, or a scheme to use cell site location in lieu of actual station set location, these are all short sighted fixes. They represent significant cost, and offer little in terms of future value. We absolutely must anticipate the broadest application of emerging technologies and insist that provisions for our life critical service be provided for in plans for their implementation.

So What's the Big Deal?

PCS⁴ is essentially the logical extension of existing cellular service. It, too, is digital RF-based wireless but it utilizes lower powered transmitters. Lower power allows reutilization of frequencies within smaller geographical areas. PCS transmitters⁵ may then be networked to a larger cellular system, or to the public switched network through a PCN (Personal Communication Network). While there are those who might underestimate the power of PCS because of its low powered transmission characteristics, make no mistake, the power is limited only by the power of those other networks to which they have access.

APCO's Project 31, chartered to represent the broad but specific interests of public safety communications relative to wireless technologies, has discovered some alarming information. The FCC concluded their report detailing specifics for PCS licensing on September 23, 1993 and expects



FREDERICK G. GRIFFIN, P.C.

The Proven Consulting Communications Engineers

- Public Safety Communications
- Telephone Engineering
- Broadcast Engineering
- Land Mobile Radio Systems
- Cellular Telephone
- CATV Communications
- Radio Trunk and SMR Systems

3229 Waterlick Road
Lynchburg, Virginia 24502

804-237-2044
Fax: 804-237-6063

Frederick G. Griffin, P.E.
President

9-1-1 Magazine

**For the Emergency Communications
and Response Community**

Each issue has important features and stories and currently carries six regular columns—all written by personnel within this exciting industry. Regular departments include: People, Places & Things; Corporate News; In Review; Product Profiles and much more. Start your subscription today by mailing the coupon below or call (800) 231-8911.

MONEY BACK GUARANTEE

If for any reason you're dissatisfied, simply write "Cancel" on your bill and return it. Also, you may cancel your subscription at any time and receive a full refund on all unmailed issues.

\$15

FOR ONE YEAR!

Six issues delivered to your office or home for this low price*

*Orders to Canada & Mexico, add \$15 per year for postage. Other foreign orders, add \$20 per year for postage.

Name _____ Title _____

Agency/Company _____

Address _____

City _____ State _____ Zip _____

☐ Home ☐ Office

Signature _____ Date _____

This card must be signed for your subscription to be processed

- ☐ **Enclosed:** If payment is included, receive one bonus issue **FREE!**
☐ **Bill:** ☐ Myself ☐ My Agency (Fed. ID#95-2384892)
☐ **Charge my:** ☐ VISA ☐ MasterCard Exp. Date: _____

For FASTER SERVICE, call toll-free 1-800-231-8911 (credit card orders only)

PRIMARY OCCUPATION Card # _____

- A. ☐ Communications
B. ☐ Law Enforcement
C. ☐ Fire Services
D. ☐ Medical
E. ☐ Related Occupation/
Other _____

Phone (_____) _____

9-1-1 MAGAZINE
18201 Weston Place • Tustin, CA 92680
(800) 231-8911 • (714) 838-9233 Fax

NENA

to hold spectrum license auctions not later than May 2, 1994. It is fully possible that we could see the next wave of wireless (PCS) technologies in the marketplace before Christmas, 1994.

Even by the most the conservative forecasts, demand for PCS is anticipated to be phenomenal. More than 60 million subscribers are expected to use the next generation of PCS services by the year 2002.⁶ Industry forecasts call for annual revenues in excess of \$30 billion. Even if reality produces only half the current forecast, in comparison with the existing cellular market (presently greater than \$7 billion annually), PCS is going to be BIG!

Who's In Charge Here?

Throughout our 9-1-1 industry community, there is no apparent national telecommunications policy champion actively pursuing the long term interests of public safety.

Among the traditional "power players" in the communications market, there isn't an obvious candidate stepping forward to assume leadership for the need of new national public safety standards or addressing the social implications of emerging technology. Since divestiture of the Bell System, there is no longer a dominant market entity that holds the power, authority, or incentive to assume the role of national systems architect.⁷

Major U.S. wireless switch manufacturers, who might logically be seen as appropriate to drive a national strategy, are so far focusing only on equipment manufacture and the development of a wireless interchange network. An example of this is Motorola who, working with federal subsidies, is pursuing a project called *Iridium*. This project will make it possible to connect wireless callers around the world through a networked system of seventy-seven low orbit satellites. From what's publicly known about this effort, there's no obvious specific public safety interest accommodated in the project.

A key finding of Project 31's work has been that the FCC has no plans to mandate compliance of PCS/PCN systems, networks or equipment to any of the E9-1-1 protocols or user requirements. Ironically, the precedent cited by FCC officials for not intervening by regulation is cellular. Clearly, they are oblivious to the problems this approach has created; they don't see that there's any problem with the way it is now! Legislators and regulators have generally adopted an attitude of *laissez faire*—an approach which might be sound economically by creating business and building gross national product but it lacks sensitivity for the social responsibility to public safety owed by the stewards of technology.

Clearly, absent unilateral industry, regulatory, or legislative action, the best hope for leadership lies with our professional organizations, NENA and APCO. But here, too, we are faced with a serious shortcoming: we typically underestimate the strength of our membership and we lack a collective *bias to action*. We simply don't realize what we can collectively accomplish because we've never before been challenged to singularly forge a public policy of such critical importance.

Images Emerging in The Mist

We identified three areas of focus for our efforts last year when we initially considered what 9-1-1 might look like in the next few years. We said that we needed to: a) consider the characteristics of the **emerging technologies**; b) persuade manufacturers towards **product development** consistent with the needs of public safety; and, c) influence **public policy** in a way that gains recognition of 9-1-1 as an essential component of universal service — a service that significantly benefits the public welfare and safety and that warrants a national policy including standards for design, manufacture, and funding.

Since that time, there have been numerous indications of concern and ample cause for encouragement. Many within our in-

dustry have come forward as interested, concerned, and desiring to "do something." Unfortunately, many of our colleagues have become entirely frustrated trying to address and resolve these issues on a local or regional basis when they are truly national in scope. Manufacturers, telephone companies, and public safety service providers alike have brought forward ideas, thoughts and yes, even some potential solutions.

First, on technology. There are sufficient technologies to allow us to do what needs to be done. GPS* alone does not provide a pure solution but when used in conjunction with other technologies, it appears to be viable. Clearly, we cannot discard this technology without examination of the full nature of its limitations. There seem to be ready solutions to intra-building signal transmission issues, range of accuracy, and availability of data signal concerns. Additionally, software conversion programs to convert existing tabular 9-1-1 data bases to GPS compatible graphic files are similarly available. Admittedly, not all is rosy: size⁹ and cost¹⁰ of manufacture continue to be important areas for improvement in the technology.

Second, there are numerous manufacturers, vendors, and software houses ready, willing and able to advance the cause of public safety. Unfortunately, most of them are not major players in our market and lack

appropriate capitalization. The larger providers (generally speaking) have a significant investment in the existing systems and simply can't abandon the present market or their investment in embedded systems. Also, while a few million dollars in incremental revenue might be "big bucks" to some businesses, they don't represent an opportunity of scale to multi-billion dollar enterprises. Thus, we still need to find a way to induce those with the capability and desire, to come forward and take an active role in transforming our national 9-1-1 platform.

And last, public policy remains the most challenging aspect of our mandate for change. Regulators and legislators have proceeded based on their perception of the needs of the public safety. For good reason, they don't have an adequate understanding of the systems, the technology, or what's required to provide an appropriate emergency service response. We need to give them appropriate information so that they might better understand our concerns and the implications of continued inaction.

The Path Ahead

The road before us appears rocky and has a number of unmarked forks. The decisions we make as we try to move forward are based upon what we believe to be true in our vision of the future. And while

IS YOUR 9-1-1 NETWORK

READY FOR THIS?



The public is counting on your 9-1-1 network to be there when they need it. *All the time*, even during natural disasters, facility outages, and equipment failures.

With Proctor's INB-911™ system, you have the peace of mind that 9-1-1 calls will still get through. We have proven, field-tested backup configurations for any situation:

- Remote Switch Unit Isolation
- Tandem and Host Switch Interruptions
- Cable Digups or Fiber Outages

INB monitors your 9-1-1 trunks, reroutes calls automatically over alternate paths (including cellular), and instantly notifies your network management center of the condition so you can begin restoral immediately.

See Us at NENA '94 Booth #327, and APCO Booth #744

Proctor®

Proctor & Associates Co., Inc. • 15050 NE 36th St. • Redmond, WA 98052
Phone: 206/881-7000 • Order Desk: 800/824-9719 • FAX: 206/885-3282



NETCLOCK/2

Legal Time for Records Mgmt.

- PSAP
- Fire
- Police
- EMS

Time Synchronize your:
Voice Recorders
CAD Systems
Dispatch Consoles
ANI / ALI
Computer System

Spectracom Corporation
716-381-4827

Visit us at NENA '94.

InterACT Computer Systems

E9-1-1 CAD GIS

Specializing In:

- Enhanced 9-1-1 Systems
- Computer Aided Dispatch Systems
- Geographic Information Systems
- Law Enforcement Information Systems
- Mapping & Addressing Services
- MSAG—Master Street Address Guide
- Data Base Management
- Consultation Service
- Telephone Systems
- Planning

639 Biltmore Avenue
P. O. Box 15084
Asheville, NC 28803

704/ 254-9876 • 800/ 768-E911
Fax 704/254-0768

this vision may not yet be final and admittedly it does not address all the issues, there are some faint images emerging from the mist. Absent a compelling shift in circumstances as we now believe them to be, these are the activities we must pursue in the preservation of our E9-1-1 systems.

A. Telephone Company 9-1-1 Data Systems

1. Conversion of ALI flat files to graphic, GEO-based structure.
 - Each existing fixed address requires assignment of an industry standard lat/long¹¹ value
 - Digital color GEO mapping data base built on standardized GPS data
2. Provisioning of network facilities to accommodate transmission of a lat/long data stream.
 - GPS utilizes a 24 bit digital data stream for X, Y, & Z coordinates
 - High speed, high capacity digital or "fast packet" PSAP network

B. PSAP Systems

1. Intelligent Workstations to support multi-tasking user requirements
 - Micro-based systems (PCs) with a Windows®-type operating system
2. Fiber optic LAN connectivity with a micro-based fileserver/controller
3. Integrated (but not dependent) voice & data system applications
4. Modular "off-the-shelf" hardware, open robust software architecture

C. Wireless (PCS) systems, equipment and devices

1. All wireless systems, equipment, and devices must be technically capable of passing lat/long data on 9-1-1 dialed calls.
 - Cellular, PCS, and Cordless hand sets

D. Other benefits that could be derived from GEO-based data files.

1. Emergency Notification/Evacuation Systems
 - HazMat Incidents
 - Hostage Scene Management

2. Rural addressing
3. Event management coordination
4. Visual response data available to field units via MVTs

E. Issues requiring near-term resolution

1. Industry standards
 - Location data source (GPS)
 - Transmission protocol
 - GEOfile compatibility
2. Systems development
 - Scope of effort and realistic volume implications have not yet been factored into feasibility
 - Cost of production and size¹² cannot be considered as prohibitive factors but they require considerable improvement
3. Public Policy
 - Regulatory definitions and requirements must be documented and enacted
 - Legislative mandates will compel public policy and industry standards affecting public safety
 - Incentives to migration to standards conformance (e.g., charging for calls to 9-1-1 from non-conforming cellular & PCS units).

And The Last Word ... for now

The challenge we face is real. There isn't anyone else who is going to come forward and save our systems, protect our investment, or assure us of the tools we need to provide for the public safety. There is no substitute for our leadership and activism. We have to make it happen!

W. Clay Paxton is executive director, 9-1-1 and emergency services of Pacific Bell and is headquartered in Sacramento, California. This strategic business unit represents the consolidation of various internal telephone staff and line disciplines to better address and provide 9-1-1 services to emergency services providers of California. Prior to joining Pacific Bell in 1980, he was a lieutenant with the Alameda County Sheriff's Department in Oakland. He holds various degrees, including an M.P.A. from California State University, Hayward.

Footnotes:

- ¹ Anthony Ramirez, "Mapping Out the Wireless-Phone Future", *The New York Times*, 11/12/92.
- ² George Raine, "Cellular phone owners dialing 911 frivolously", *The San Francisco Examiner*, 2/25/93. (Does not include fixed cellular "Freeway Call Box" calls.)
- ³ Tony Rogers, "Cellular Samaritans becoming the eyes of the highway patrol", Associated Press, 1/5/93.
- ⁴ PCS (Personal Communications Services) is a family of wireless communications services and devices which operate over a wide range of radio frequencies assigned and authorized by the FCC. Early examples of PCS deployment is evident in car phones, pagers and wireless LANs and modems.
- ⁵ A transmitter may be dedicated to a single building, PBX, or neighborhood.
- ⁶ Telocator, The Personal Communications Industry Association, Washington D.C., 1992.
- ⁷ The recently announced alliance between AT&T and McCaw Communications could signal a change in the balance of power in this regard ... but don't hold your breath for a significant change in approach.
- ⁸ Global Positioning System is a federal network of 24 satellites principally utilized by the Department of Defense for navigation and advanced weapons systems. Satellite signals are passive, that is, they are in the environment and available for general usage. Many

commercial geographical and tracking systems use GPS for some or all of their tracking data. Signals available for general public use are degraded and require additional modulation to get accuracy to acceptable public safety requirements (within 1 meter).

- ⁹ Size of the boards which contain a micro processor, multiple (6) satellite transponders, power supply, and various other components are now down to about the size of two back-to-back silver dollars.
- ¹⁰ Cost of manufacture is currently about \$112.00 for the full component board. Further technological evolution could reduce this cost as could a network design wherein additional data manipulation functions are performed on the public network or within the E9-1-1 data base system(s).

- ¹¹ Lat/long infers a GPS-type data format which includes latitude, longitude, and elevation (X, Y & Z).

- ¹² Cost of providing location data cannot be allowed to increase the price of wireless telecommunications beyond the reach of the mass market. Likewise, the size of PCS devices are rapidly being scaled down and are now available in units about the size of ordinary pagers and expected to be available in wrist watch size before the turn of the century. The size of requisite locator components must not threaten this market-driven evolution.